Retrolental Fibroplasia*

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HISTORY.

THIS abnormal condition which occurs in premature infants was first described by Terry in 1942. Terry described what is now known to be the final stage of the condition :—impairment of vision, nystagmus, squint, photophobia, microphthalmos, shallow anterior chanber and an opaque membrane behind the lens.

The early signs were not described until 1949, when Owens and Owens reported their observations. The first sign was dilatation and tortuosity of the fundal vessels (which was noticed from 4-12 weeks after birth); this progressed to retinal œdema, separation of the retina, and finally the formation of a retrolental membrane by organisation and fibrosis of the separated retina. Both eyes were usually affected, and spontaneous arrest was possible at any stage: indeed, different stages might be present in the two eyes.

In the U.S.A. the incidence has increased yearly since 1945, and retrolental fibroplasia is now said to account for one third to one half of blindness in young children. The incidence varies from area to area, and even from hospital to hospital in the same area.

In England the condition has been found in infants born as early as 1945, but few cases occurred before 1949. In most areas the incidence is increasing, and in some, the increase is alarming.

DIFFERENTIAL DIAGNOSIS.

Retrolental fibroplasia must be differentiated from a number of conditions :—

(1) *Persistent Hyaloid Vessels.* This condition is usually unilateral. It is present at birth, then disappears. Hæmorrhages and detachment of retina are not found.

(2) *Persistent Hyperplasia of Primary Vitreous.* This condition is usually unilateral and generally occurs in full-time infants. It can be detected shortly after birth (Reese).

(3) *Retinoblastoma.* This is unilateral, and often present at birth. The tumour has a yellowish tinge on ophthalmic examination, and there is X-Ray evidence of ocular calcification.

(4) *Congenital Cataract.* Cataract is usually unilateral and the opacity is *in* the lens.

(5) *Congenital Toxoplasmosis.* This is a differentiated by specific tests for toxoplasmosis.

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(6) *Congenital Encephalo-Ophthalmic Dysplasia* (Krause). This syndrome includes neurological signs (microcephaly, hydrocephaly, cerebral dysplasia or mental retardation). It occurs also in full-time infants.

Early ophthalmic examination is of great assistance in the differential diagnosis of retrolental fibroplasia.

Possible Causes.

Because retrolental fibroplasia has only occurred during recent years, a pre-natal or congenital condition is unlikely to be the complete cause but it is impossible to exclude some pre-natal tendency to the condition which has been activated by one of the recent changes in post-natal care.

In fourteen Birmingham cases no relationship was found with any pre-natal condition and the preponderance of females and twins in this group of cases was similar to that for all surviving babies in the same weight group.

Possible post-natal causes include a better survival rate and recent changes in post-natal care. In addition, some new form of infection cannot be excluded.

The high incidence of cases in some areas cannot possibly be accounted for by the relatively small increase in survival rates. In the Birmingham Premature Baby Unit the majority of cases occurred during 1949, a year when survival rates were not at their highest.

Modern changes in the care of the premature baby which must be considered include :—

(i) Preliminary starvation period.

(ii) High-protein low-fat formulæ.

(iii) Variations in the type and administration of vitamin preparations.

(iv) Variations in the administration of iron.

(v) Increased administration of blood transfusions.

(vi) Use of new antibiotics.

(vii) Increased use of oxygen and different methods of administration.

In the Birmingham cases no relationship could be found with any of these factors except prolonged increased administration of oxygen.

According to Kinsey and Zacharias (1949), the incidence of the condition rose strikingly with increased number of days in oxygen. Was this because the child who is suffering from this complication requires more oxygen, or was the prolonged administration of oxygen a causative factor?

According to Szewczyk (1951), the whole picture can be explained by anoxia. When oxygen falls below the requirements of the fœtal retina, dilatation and tortuosity of the retina vessels occurs and new channels develop. If the need for oxygen is not met in this way, then œdema develops in the most fœtal (peripheral) parts of the retina, giving rise to greyish-white areas. If the retina uses all the oxygen available the venous walls will suffer, and transudations (accounting

for vitreous opacities) and hæmorrhages will occur. These lead to separation of the retina, the retina is pushed forward and atrophy and fibrosis occur.

If this condition were due to the administration of insufficient oxygen, the incidence would not be increasing with the modern tendency to use *more* oxygen. There is, however, the possibility that a *relative anoxia* is produced after acclimatising the infant to high oxygen tensions. In support of this theory, the following points can be made :—

(1) The condition does not arise while the infant is in an atmosphere with a high percentage of oxygen, but only after removal from such an atmosphere.

(2) In the U.S.A., oxygen beds were employed at an earlier date than in this country, and cases developed in the U.S.A. some years before they occurred over here.

(3) Nearly all cases (U.S.A. and England) occur in a few large centres which have special Premature Baby Units with facilities for the administration of oxygen.

(4) The occurrence of cases in this country has coincided either with the increased use of oxygen in established Premature Baby Units, or with the setting up of new units with full facilities for oxygen administration.

(5) The incidence has been reduced in Birmingham by limiting the administration of oxygen to cases showing cyanosis, and limiting the percentage of oxygen to the minimum required to keep the child pink : in other words, returning to the methods used before retrolental fibroplasia occurred. The use of oxygen has been limited in this way in two Birmingham Premature Baby Units (in one Unit for nearly two years and in the second for nearly a year and a half). Since the adoption of this practice, the survival rates have been maintained at the same level, but no further case of blindness has occurred. Two cases with early reversible changes occurred in one of the Units : they both returned to normal without treatment, and would not have been recognised if a routine weekly ophthalmic examination had not been carried out. It was interesting to note that both these cases required considerably larger amounts of oxygen than usual for their survival.

Against this theory it must be admitted that very occasionally an isolated case is reported, to which no oxygen has been given.

Administration of oxygen appears to have a very definite association with the development of retrolental fibroplasia, but more research is required to determine the method of causation and means of prevention. Accurate knowledge is of vital and urgent importance if this serious complication is to be prevented, and last October the Medical Research Council started an investigation into the possible causes of retrolental fibroplasia.

Treatment.

Even in the light of present knowledge, blindness due to this condition may be preventable if the obstetrician, pædiatrician and ophthalmic surgeon work together as a team.

(a) *Prevention.* Other factors being equal, the obstetrician should make every effort to prolong pregnancy until the infant weighs more than 4½ lbs. (i.e. 34-35 weeks gestation). The pædiatrician should only allow oxygen to be given to those infants who cannot maintain a good colour without it, and should keep the percentage of oxygen down to the lowest level which will maintain a pink colour. If prolonged administration or high concentrations are necessary, the infant should be weaned off the oxygen gradually and the fundi watched carefully.

(b) *Curative.* The ophthalmic surgeon should examine the fundi of all infants weighing 4½ lbs. or less at birth. The first examination should be made as soon as reasonably possible, and in all cases before the age of four weeks. Infants treated with oxygen should be examined within one week of stopping the administration of oxygen. Subsequent examinations should be made weekly.

Atropine ointment (1 per cent) should be used because drops may cause atropine poisoning. Good results are obtained with two applications 12 and 24 hours before the examinations.

If retinal œdema, vitreous opacities or hæmorrhages are seen, A.C.T.H. should be given (20 mg. twice daily for 7 days and repeated later if the condition progresses). Dilatation and tortuosity of the fundal vessels and pallor of the periphery of the retina are common findings in premature babies and do not require treatment unless later stages develop.

Szewczyk has suggested that infants who show early signs of retrolental fibroplasia might be cured by returning them to a high concentration of oxygen, but sufficient trial has not yet been given to this treatment.

References.

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